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At the meeting held April 27, 1897, Dr. W. T. Councilman presented an abstract of a paper to be read before the Association of American Physicians in Washington, May, 1897, on

"EPIDEMIC CEREBRO–SPINAL MENINGITIS."

In 1886 Weichselbaum described, in six cases of epidemic cerebro-spinal meningitis, an organism which appeared in the form of a diplococcus, always within the cells, and which decolorized by Gram. He gave to it the name of diplococcus intracellularis meningitidis. He grew it in pure culture and found that it developed only at thermostat temperatures and best on agar. He inoculated mice, rabbits and dogs with pure cultures of the organisms so obtained. The animals died at periods varying from two to four days, and he found a fibrinous exudation in the serous cavity inoculated. Subcutaneous inoculations with the organism were without effect. These observations of Weichselbaum were

confirmed by single observers, but on the whole little attention was paid to them until 1895, when Jaeger, in an investigation of twelve cases of the epidemic form of the disease occurring in the barracks at Stuttgart, confirmed them, although he did not add anything new to his description. Since then there have been several other observations in Germany in which this organism has been found.

Up to that time the bacterium which had been most frequently described and associated with the disease, was the diplococcus lanceolatus. This has been found in cases accompanied by pneumonia and endocarditis, due to the same organism; in cases without pneumonia, apparently due to primary infection of the meninges; and in cases in which the meningitis has followed disease of the middle ear. It has also been described as the causative agent in the epidemic form of the disease.

In this country Flexner and Barker, in 1894, investigated an epidemic of cerebro-spinal meningitis in Laoccoing, in Maryland, and in two autopsies they described the finding of the pneumococcus. In only one of the cultures made from one autopsy was the organism found, but they succeeded in finding it in the tissues of both. The inoculations made on animals were negative. The description of the lesions given by Flexner and Barker and the results of the animal inoculations and cultures would speak rather in favor

of the organism found being the micrococcus intracellularis, but they state distinctly that in the tissues were found lancet shaped diplococci, which stained with Gram, which would establish them as the pneumococcus.

In a recent epidemic of cerebro-spinal meningitis in Boston, the diplococcus of Weichselbaum has been found in nearly all cases. In nine out of twelve autopsies, made on the disease, it has been seen either in cover-slips, in cultures, or sections, and usually in all.

There is little to be added to the description as given by Weichselbaum. We have found it to grow best on blood serum. The growth appears on this after 24 hours in the shape of moist, rather viscid, grayish, opaque colonies, slightly elevated above the surface. One peculiarity is the presence of many apparently dead bacteria which will not grow on the culture media. Even when microscopic examination of cover-slips showed them present in large numbers only single colonies appeared on the blood serum. Microscopic examination of the culture shows organisms varying considerably in size almost always arranged in the form of diplococci or tetrads ; occasionally chains consisting of 3 to 6 cocci are found.

We have not been able to confirm the observation of Jaeger that the organism could grow out into comparatively long chains, simulating streptococci. The

examination of the cultures shows also a great variety in staining; some stain clearly with methylene blue; others are swollen and stain imperfectly. Both in the tissues and cover-slips they are completely decolorized by Gram. In bouillon they do not grow with the same facility as on blood serum, and in order to produce a growth it is necessary to inoculate a large amount.

Dr. Wright, at the Massachusetts General Hospital, has found that in bouillon a scanty greyish sediment is formed, which rises in the form of a viscid string, when the test-tube is shaken.

The diplococcus has been found pure in most cases, in others it has been associated with the pneumococcus and with a streptococcus. The lesions found at autopsy differed but slightly in the different cases. The exudation is found in the pia arachnoid of the convexity of the brain along the course of the vessels, and in greatest amount in the sulci. There is usually more at the base of the brain than anywhere else, and here it is often found to follow along the cerebral nerves extending even into the foramina. In all cases the cord has been also involved. In the cord the exudation is chiefly along the posterior surface. The exudation in the brain is always in the meshes of the pia-arachnoid and not on the surface. In the cord it is frequently found free in the sub-dural space lying on the surface of the pia. Microscopically the exudation

consists chiefly of pus cells and fibrin. The fibrin though present is never in the same amount as in cases of pneumococcus meningitis. Where the exudation is extremely thick the fibrin is often swollen up and forms hyaline masses. The diplococcus is almost exclusively found in the pus cells. They occur in greater numbers in the exudation in the cord than in the brain. A few are found outside of the pus cells, their presence here being probably due to the breaking down of the cells containing them. In the exudation there are always found large swollen cells with a vesicular nucleus. Many of these contain leucocytes showing more or less degeneration, which lie in a vacuole in the cell. Among these large cells there are very large protoplasmic masses, many of which are as large as the giant cells in tuberculosis, filled with granular material and nuclear detritis. These large cells result from the proliferation of the endothelial cells of the lymph spaces in which nuclear figures have been found. The diplococci have never been found either in these large cells or in the leucocytes which they contain. In a few cases, foci of purulent infiltration and haemorrhage have been seen in the tissues, both of the brain and cord. The organisms have in general occurred only in the lesions of the disease. There is no septicaemia. Dr. Wright found them once in foci of broncho pneumonia in the lungs and in the nasal sinuses. The other lesions are entirely secondary. Enlarge-

ment of the spleen is frequently present, but does not reach a high degree. Broncho pneumonia has been present in nearly all of the cases; in some there has been some swelling of the lymphatic glands.

The results of inoculations have not been as satisfactory in our hands as in the hands of Weichselbaum and Jaeger. Subcutaneous inoculations failed. Rabbits and guinea pigs have been found the most susceptible. It is possible in some cases to kill these by injecting large amounts (cc. or more, of a pure culture,) into the pleura and peritoneal cavity, with the production of a fibrinous exudation.

The organism has also been obtained in 19 cases where lumbar puncture has been made for purposes of diagnosis. The fluid withdrawn varies in appearance from a clear or very slightly cloudy serous fluid up to almost pure pus. When withdrawn in the beginning of the disease it is always more purulent than later. In one case, which was tapped three times, the fluid was at first decidedly purulent, and in the last tapping almost clear. Microscopically it contained poly-nuclear leucocytes, here and there a lymphoid cell, and a few large cells, evidently of endothelial origin. The bacteria are present in variable numbers and almost always in the pus cells. In these, sometimes a single coccus is found, sometimes the cell may be filled with them. Their resemblance to the gonococci is very strong. They may be distinguished

from these by their less intensity of staining and by their slight variability in size. There should be no possibility of confounding them with the pneumo-cocci from which they may be distinguished, not only by their shape, but by their staining reaction and by the differences in culture.

Without denying the possibility that cerebro-spinal meningitis, even in an epidemic form may be produced by the pneumococcus, we are disposed to think that most cases of the severer epidemics will be found to be due to this organism of Weichselbaum.

(I have been greatly indebted to Drs. Mallory and Leary, at the City Hospital, to Dr. Wright, at the Massachusetts General Hospital, and to Dr. Wentworth, at the Children's Hospital, for their observations on the disease.)

Dr. D. A. Sargent spoke upon

"STRENGTH TESTS AND THE STRONG MEN OF HARVARD."

In January, 1880, the present system of Strength Tests was introduced at Harvard University in connection with the physical examinations at the Hemenway Gymnasium.

On account of its accuracy in registering, its simplicity of adjustment and its convenience in handling, the modern spring dynamometer has been adopted as

the basis for the Harvard Strength Tests. But a test of muscular power alone does not give one any knowledge of a man's ability to repeat his efforts. This brings into requisition other attributes which depend upon a good circulation, vigorous heart and lungs and a well developed and well controlled central nervous system.

As a test of these qualities, and because one can attain the limit of his efforts much quicker, each person examined is required to push his weight up between two parallel bars, "dipping" as it is termed, as many times as possible. This performance is then followed after a minutes' rest by an attempt to pull one's weight up from a hanging position with straight arms, until the chin is on a level with the hands which grasp a bar or two suspended rings. These two performances, although they bring different muscles into play, follow each other so closely that the heart, lungs and nervous system, in addition to the muscles employed are put to a pretty severe test.

Previous to making these repeated efforts, the volumetric capacity of the lungs has been taken with a spirometer, and the propulsive efforts of the expiratory muscles have been measured by a manometer. The heart and lungs are also examined by the aid of the stethoscope before and after these exercises.

One of the first requirements in order to have the strength test go on record, is that all of the tests shall

be made consecutively, and that they shall be made inside of fifteen minutes.

The handle bar for the dynamometer used for the lifting test must be a rounded piece of wood not over twelve inches long nor more than one and one-quarter inches in diameter.

In making the test for the strength of the back, the legs must be kept straight at the knee. Although this position brings considerable strain upon the "ham strings" and extensors of the thighs, the main part of the strain comes upon the muscles of the back, as the back is bent forward at an angle of 60, 70, or 80 degrees.

In making the leg lift, the body is held erect with the chest thrown forward, and the knees bent at any angle to suit the physical peculiarities of the lifter. In this test the handle bar is placed upon the thighs and held there, firmly grasped by the hands with the fingers beneath the bar. While in this position the grip is secure, as the fingers are pressed between the handle bar and extensor muscles of the leg.

The all-round nature of the different tests makes it desirable to have a general summary, in order to determine a man's all-round ability. This summary is made up as follows: The strength of the back and legs, the grasping power of the right and left forearms, and the strength of the lungs, so called, are first added together as evidence of the muscular

strength of the parts tested. To this amount is added the number of times the body is lifted in the manner described on the parallel bars and rings, multiplied into *one tenth of the weight.

The summary of all the tests may be considered as the total actual strength, as contrasted with the potential strength which may be said to be represented by the body measurements.

In order to judge of the tests made by the mass of the students let us take a specific case. Mr. A. was examined at the gymnasium in January, 1880. At this time his strength of lungs was found to be ten hectograms, his strength of back 100 kilos, legs 160 kilos, right fore-arm 40 kilos, left fore-arm 36 kilos. His weight was 60 kilos. In making the test on the parallel bars he pushed his weight up five times, and pulled his weight up on the rings four times. The sum of these two efforts (nine times) multiplied into one-tenth of the weight (6.0 kilos) equals 50 units of work, or "points" as they are generally termed. These points are added to the other tests and the total strength is found to be 400 points. In getting at this result it will be noticed that hectograms, kilograms and number of times tne body is raised, etc., are added together promiscuously, since this process in no way affects the tests, which are simply relative.

*Note. The reason why one-tenth of the weight is used for a multiplier instead of the whole weight, is simply to reduce the number of figures which are entered upon the records.

Out of 579 men examined in 1880, five per cent failed to make a total equal to 275 points, ten per cent fell below 300, twenty per cent fell below 325, while only five per cent succeeded in making a total exceeding 550 points. 400 points were the number that fifty per cent surpassed and that fifty per cent failed to reach. The strongest man in 1880 had a total of 675.2 points. The next year, 1881, the showing made with the strength tests is even poorer, as fifty per cent of all the men examined for the first time this year failed to make a total test of 350 points. This drop may be readily accounted for by the fact that the examinations in 1881 were largely of Freshmen, who presumably had had little physical training, while the previous year included the older men from all the classes.

The tests made, therefore, in 1880, give us a very good idea of the physical condition of the mass of students in College at that time, and the tests made in 1881 show us the physical status of the Freshmen as they came to us from the preparatory schools. From this year, 1881, onward to 1897, there has been a gradual increase in the strength tests of the incoming classes.

In 1880 the medium or average strength of the 579 men examined from all the classes then in College was 400 points. The average for the 689 men examined in 1896, from Jan. 2nd. to June 1st., the same period as covered by the examination in 1880, was 625 points.

To what is this remarkable increase of strength

among the student class of the community attributable? I have no hesitation in saying that this general improvement in muscular power furnishes us with indisputable evidence of the low muscular tone of the students in college in 1880 and of the extensive practice among our youth at the present day of some form of physical exercise.

In the students of the present generation this power has been greatly augmented by inherited vigor, better nutrition and habits of living, better sanitary conditions, and improved methods of physical training.

Not only are the young men who now come to college in better physical condition than those who entered in the early eighties, but many of them are possessed of the necessary knowledge for keeping themselves so.

At the present time all students of Harvard University desiring to enter as competitors in athletic contests are required to give evidence of their ability by making a strength test according to the method described in addition to the regular examination. Candidates for the University Crew and Foot Ball Team and Weight Throwers are expected to make a total strength test of 700 points. Candidates for the Class Crews and Foot Ball Teams and Gymnastic, Wrestling and Sparring Contests 600 points. Candidates for the University and Class Ball Nines, Lacrosse Teams, Track and Field Events 500 points.

The great mass of young men who can never hope to make any of the University Athletic Teams, as these numbers are necessarily limited, can have at least the satisfaction of trying to attain and pass the strength standard required of the members of these organizations. I think perhaps this has been one of the strongest factors in raising the average of the strength tests during the past few years.

Another incentive has been given to these contests by classifying those examined into groups, where the method pursued bears some resemblance to that used for ranking men in their studies. Those who get over 1000 points are classed in the * group, those who get between 800 and 1000 are classed in group A, those between 700 and 800 in group B, between 600 and 700 in C, 500 and 600 in D, 400 and 500 in E, 300 and 400 in F, and 200 and 300 in the lowest group, G.

Without going into details we may readily classify all exercises into two great groups, those which enable the body to handle its own weight, and those which enable it to bear the burdens which may be imposed upon it. In regard to the action of the lower limbs, these groups are often identical, but as applied to the trunk and movements of the upper limbs they are often antagonistic. The great force with which man is always contending is gravity, and the peculiar formation and anatomical structure which we call man has been developed largely by the effort to move about in an upright position.

If a light weight is carried for a long time in the hands, or if frequent attempts are made to lift very heavy weights, the shoulder girdle will be drawn downward, and the chest walls compressed. If the weight is carried in one hand the shoulder on that side will be drawn down, and the spine will be curved to that side. If on the other hand frequent attempts are made to lift light weights, thereby contracting both the trapezius and deltoid — the shoulder girdle will be gradually raised, and the chest walls expanded. If these exercises are supplemented by such as may be performed on parallel bars, suspended rings, ladders and horizontal bars, where the arms have a fixed attachment and the force that is operating on the trunk is upward — all of the diameters of the chest may be greatly enlarged.

When the muscles about the chest, shoulders and upper back become too much developed they restrict the movements of the arms, and actually interfere with the function of respiration. A man so developed would find it very difficult to box, throw a ball, put the shot or do anything with the arms requiring great range of movement. Such a man is literally incapacitated for the performance of certain feats by the extreme development of antagonistic muscles.

One of the attractive strength feats the world over has been the elevating of heavy weights above the head. The weights usually used have been dumb-

bells on account of the convenience of manipulating them. The men who have held the records for these performances in the past have usually been heavy men, ranging from 200 to 300 pounds. The advent of Sandow introduced a new method which has made it possible for comparatively light men to compete with heavy men in these weight elevating performances. The philosophy of this new method, apparently so opposed to all known physical laws, has never to my knowledge been satisfactorily explained.

We have among our own number (for he is a member of the Harvard Medical School) a young man who has succeeded in establishing a new world's amateur record by elevating a 2:1 pound dumb-bell from the floor to his right shoulder with both hands, and to a vertical position above his head with one hand. The remarkable fact about this performance is that Mr. Rood weighed only 145 pounds at the time the feat was accomplished.

The development of the grip was one of the first things to which Mr. Rood had to give his attention. That he has made progress in this direction he will show you before the evening is over by tearing two packs or 104 playing cards asunder in one continuous effort. (This was done later.) Having developed the grasping power of the hands the next difficulty was to raise the bell to his shoulders. The bell is grasped firmly with the right hand while the left

hand is held in the air very much as in a starting position for a running race; then, after taking two or three long breaths, the bell is grasped with the left hand, while the pelvis drops backwards allowing the legs to bend at a right angle at the knee. The right elbow is then swung on to the right thigh, and using this point for a fulcrum, the bell is by the aid of the flexors of the right arm lifted from the floor, as if by a crane, while it is pushed over and elevated to the right shoulder by the combined action of the left arm, left chest and the muscles of the back and legs. When in this position a deep breath is taken, and the right elbow and lower part of the right upper arm rest on the pelvis and lower ribs of the right side. From this position it will be observed that a lighter dumb-bell would be started on its upward journey by a contraction of the long head of the biceps, coracobrachialis, and the anterior fibres of the deltoid, but for so heavy a weight these muscles would avail nothing, because they are obliged to work at such a disadvantage, almost directly against the joint in the glenoid cavity. But unless the deltoid acts it will be impossible for the triceps to act, for in its present position an effort to straighten the arm would simply result in the bell being pushed downward to the floor.

While the bell is poised on the forearm which is resting at the elbow on the crest of the ilium, the body begins gradually to bend over to the left side sending

down a prop in the shape of the left arm to the left knee, thereby securing a broader and a firmer base, but in so doing the ribs on the right side are bulged outward and upward, the weight of the bell is gradually shifted from the elbow to the humerus which now tilts as it were over the rounded ribs like a see saw over a barrel. While in this position the deltoid and triceps have an opportunity to act in a peculiar and very efficient manner. It will be observed that when the right arm and body are in this position the fore-arm is balanced upon the ribs by the alternate play of the triceps and biceps. If the triceps relax, the bell loses its balance and tends to fall towards the shoulder, but this movement aids the deltoid which is struggling to lift the humerus away from the body. If on the other hand the biceps relaxes, the bell tends to drop downward, by straightening the fore-arm at the elbow, but this is just what the triceps is trying to do. In a word by putting these antagonistic muscles against each other, and by carefully watching its opportunity the deltoid is finally able to lift the humerus up on to a line with the shoulder, so that the arm is straight above the head, when the powerful muscles of the right lateral trunk, and erector spinae group have but little difficulty in bringing the body to an upright position.

In the execution of this feat by this peculiar method, the performer is greatly aided by the relaxed condition of the pectoralis major and latissimus dorsi, and

the opportunity to bring into action the serratus magnus. But the one thing that makes the feat possible for a light man, is not so much the great strength of the arms and shoulders, as the ability to flex the spine by relaxing the muscles about the waist and loins.

Sometime ago Dr. Dwight called the attention of the Society to the ability of contortionists to relax or inhibit the contraction of antagonistic muscles. I have no doubt in my own mind that the ability to perform certain athletic feats, including feats of strength, may be attributed to the same power.